

## POLYMER MIXTURE

This application is based on and claims the benefit of German Patent Application No. 10108347.5 filed February 21, 2001, which is incorporated by reference herein.

### Background of the Invention

5        The invention relates to a polymer mixture based on fluoropolymers. Fluoropolymers, such as polytetrafluoroethylene, ethylene-tetrafluoroethylene copolymer, tetrafluoroethylene-perfluoropropylene copolymer, perfluoroalkoxy copolymer, polyvinylidene fluoride, polyvinyl fluoride, polychlorotrifluoroethylene, ethylene-chlorotrifluoroethylene copolymer, or mixtures of these polymers, are non-  
10        combustible, highly weatherproof and physiologically inert within the application range. They have application temperature ranges with broad lower and upper limits that other plastics cannot reach, are highly corrosion and solvent resistant and have excellent electrical values which depend on their chemical structure.

      Polytetrafluoroethylene has valuable application properties in optimum  
15        combination. The disadvantage is that polytetrafluoroethylene cannot be thermoplastically processed above its melting temperature of 327°C due to its extremely high viscosity. Extruded shapes of polytetrafluoroethylene, particularly insulation or sheathing on cables and lines can be produced only by ram extrusion or paste extrusion.

20        Tetrafluoroethylene-perfluoropropylene copolymer (FEP) and perfluoroalkoxy copolymer (PFA) are modified for thermoplastic processing but require very high processing temperatures.

Ethylene-tetrafluoroethylene copolymer (ETFE) is much easier to process but this processability in more accessible temperature ranges is bought at the price of a maximum service temperature lower by about 100 K.

All of the fluoropolymers cited have in common that items manufactured from these materials are very expensive. On the one hand, the fluoropolymers are very costly compared to most other thermoplastics, on the other hand, the costs to process them are also higher.

For this reason, the application range for these materials is limited to specialty products.

## 10 **Summary of the Invention**

The object of the present invention is to provide a polymer mixture based on fluoropolymers which can be thermoplastically processed and is significantly more economical to produce than the pure fluoropolymers that have thus far been used.

This object is attained by a polymer mixture of a thermoplastically processable fluoropolymer and a sulfur polymer, wherein the sulfur polymer component in the polymer mixture is 0.1 to 20% by weight.

Other advantageous embodiments of the invention will be apparent from the following detailed description of the invention in conjunction with the appended claims.

20 In addition to the advantages resulting from the problem formulation itself, it has also proven advantageous that a higher tensile strength and a higher elongation at break compared to pure fluoropolymers can result.

Adding sulfur polymers makes it possible to lower the processing temperature of fluoropolymers.

## Detailed Description of the Invention

The invention will now be described in greater detail by means of an exemplary embodiment.

90 parts tetrafluoroethylene/hexafluoropropylene copolymer (FEP) and  
5 10 parts polysulfone (PSU)  
mixed in granulate form are introduced into an extruder and at a temperature of 350°C  
are applied to an electric conductor.

As a comparison, pure tetrafluoroethylene/hexafluoropropylene copolymer  
(FEP) in granulate form was introduced into an extruder and at a temperature of  
10 360°C was applied to an electrical conductor. In both cases the conductor cross  
section was 0.5 mm<sup>2</sup>, the wall thickness of the insulation layer was 0.2 mm.

The sheathed electrical conductors were subjected to a quality test.

The following values were obtained:

	Parts	
FEP	100	90
PSU		10
Mechanical Properties		
$\sigma_b$ [Mpa]	27	40
$\epsilon_R$ [%]	205	215
Mechanical Properties after Aging		
$\sigma_b$ [Mpa]	27	45
$\epsilon_R$ [%]	210	205
Thermal shock (250°C/6h), 1 kV/1 min		

Passed	yes	yes
Electrical Properties		
$\tan \delta$	$1 \times 10^{-3}$	$1 \times 10^{-3}$
Volume resistance	$7.9 - 10^{16}$	$4.0 \times 10^{16}$
Dielectric constant	1.91	1.93
Extrusion Temperatures		
Temperature [°C]	330 – 390	330 – 380